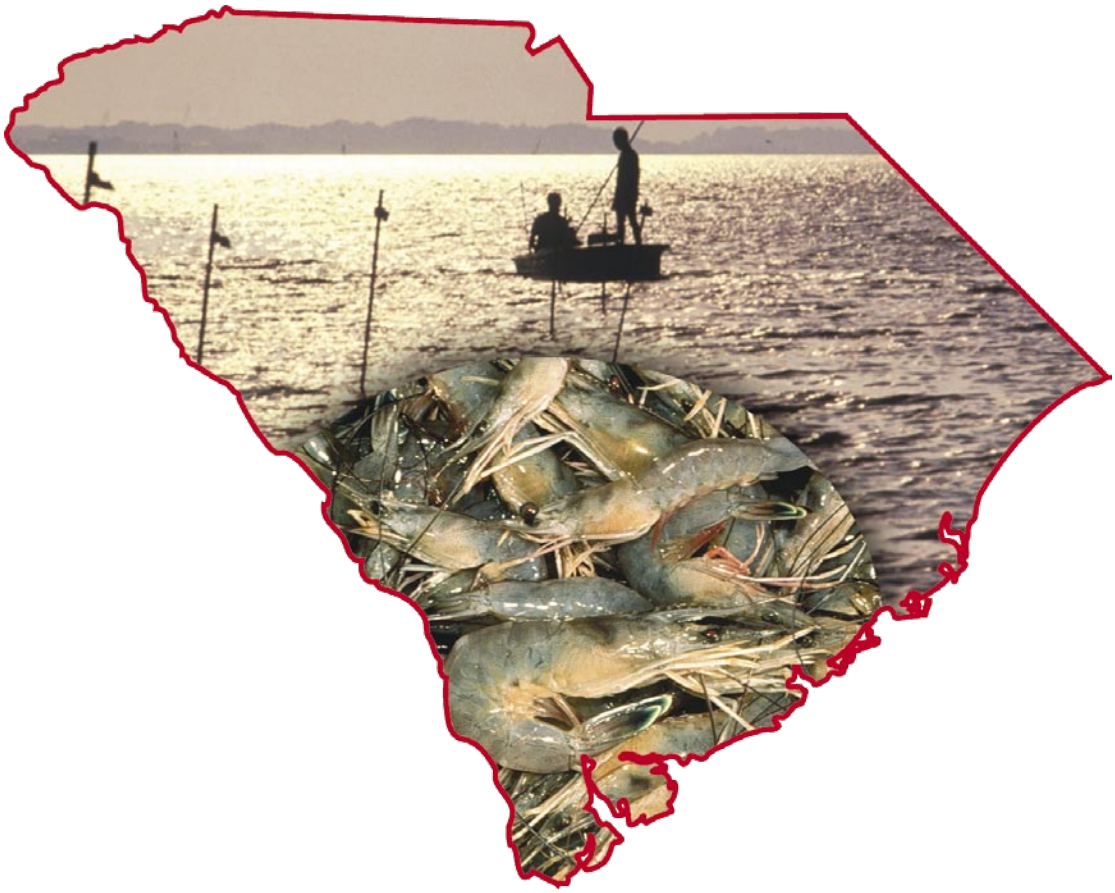
Survey of the South Carolina Shrimp Baiting Fishery, 2006



Data Report Number 41

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INTRODUCTION

Theiling (1987) first described the history of shrimp baiting in South Carolina. Surveys have been conducted annually since 1987, using various approaches to address several objectives and issues. Approaches have included creel surveys, windshield surveys, and post-season mail surveys (Low 2002). These surveys have obtained statistics on participation, effort, and catch for each season, in addition to information on demographics of participants and constituency opinions on management options, user groups, and economic issues.

Data for the 2006 shrimp baiting season were obtained from a post-season mail out survey. The objectives were to estimate the total participation (the number of active license holders and their assistants), total effort in numbers of trips, total catch, and effort and catch by shrimping area and residence category.

METHODS

The post-season mailing was similar to those of previous years. The survey package consisted of an introductory statement and a pre-addressed business reply postcard questionnaire (Figure 1). The package was sent by first class mail to 40% of the individuals who purchased a shrimp baiting license in 2006. The sample was randomly selected and stratified in direct proportion to the percentage of license holders residing in each county. A two-month return period was specified in order to minimize problems associated with recall and provide an adequate sample size for the analysis. Any responses received after the two month period were not included in the analysis. For the second consecutive year, an additional survey conducted by the University of South Carolina's School of Public Health was also included in 400 (10%) of the survey packages. USC is conducting research on human health and seafood consumption and used this survey to collect information on local seafood consumption rates, preparation techniques, and preference of species consumed. (Results from the USC survey can be seen in Appendix 1.)

1. What **County** do you live in?_____
2. How many **Trips** did you make using **YOUR** permit and gear?

   ____Sept. ____Oct. ____Nov. ____All Season
3. Please indicate the number of **Trips** you made in each **Area**.
   (Refer to map on cover letter)

   ____Beaufort ____Charleston ____St. Helena Sd.

   ____Bulls Bay ____Wadmalaw/Edisto Is. ____Georgetown
4. How many **Different People** assisted you on your boat?_____
5. What was your **Average Catch Per Trip** in quarts of whole shrimp?_____
6. What was your **Total Catch** for the season?_____quarts of whole shrimp
7. Approximately how many years have you had a shrimp baiting permit?

   ____1 – 2 years ____6 - 10 years ____ greater than 15 years

   ____3 – 5 years ____ 11 – 15 years

Figure 1. Post-season mail questionnaire.

RESULTS

The effective mailout (after subtraction of non-deliverables) was 3,950 with a return rate (usable responses) of 31% (N = 1228). Usable responses were determined by specific criteria including, date of return, identification of residence county, accuracy in reported catch, and means of shrimping (i.e. off boat or dock). Fourteen respondents indicated they did not use a boat to shrimp. These responses were not included in the analysis and represented only 1% of the respondent population. Catch rates from these participants averaged approximately 2 quarts per night (range = 0 – 6 quarts per night).

Distributions of the license holder populations by county of residence in the first year of license sales, the average of the last three years, and in the current year are shown in Table 1. The distributions of the 2006 license holder population and survey population are compared in Table 2. As has been generally the case, the return rates from non coastal residents (~34.43%) were slightly higher than coastal residents (~28.42%). However, the overall distribution of the sample group was comparable to that of the total population and therefore was sufficiently representative of the overall shrimp baiting population.

Participation

About 29% of respondents indicated that they had made no trips using their gear and tags. The percent of active license holders was the lowest on record, showing a 2% decrease from 2004's previous all time low of 73%. The estimated number of active

Table 1. Distribution of license holder populations, in percentages of license holders by counties.

County	1988	2003 - 2005	2006
Abbeville	0.10	0.40	0.41
Aiken	2.00	4.05	3.90
Allendale	1.20	0.61	0.59
Anderson	0.20	0.79	0.79
Bamberg	1.50	1.01	0.95
Barnwell	1.30	1.59	1.49
Beaufort	10.30	12.03	11.65
Berkeley	9.40	6.93	7.02
Calhoun	0.40	1.05	0.83
Charleston	41.20	20.86	22.86
Cherokee	<0.1	0.12	0.10
Chester	<0.1	0.15	0.16
Chesterfield	<0.1	0.13	0.20
Clarendon	0.10	0.82	0.78
Colleton	5.00	3.88	3.42
Darlington	0.10	0.88	0.75
Dillon	0.00	0.38	0.41
Dorchester	6.90	4.52	4.58
Edgefield	<0.1	0.52	0.50
Fairfield	0.10	0.38	0.41
Florence	0.20	2.42	2.37
Georgetown	2.40	5.06	4.95
Greenville	0.20	1.49	1.74
Greenwood	0.10	0.68	0.63
Hampton	4.00	2.60	2.40
Horry	0.30	3.78	3.78
Jasper	3.40	1.74	1.58
Kershaw	0.10	0.70	0.75
Lancaster	0.00	0.33	0.40
Laurens	0.10	0.57	0.50
Lee	0.00	0.10	0.12
Lexington	2.50	5.86	5.56
Marion	0.10	0.25	0.26
Marlboro	<0.1	0.04	0.06
McCormick	<0.1	0.17	0.14
Newberry	0.20	0.73	0.59
Oconee	<0.1	0.45	0.55
Orangeburg	4.00	3.14	2.92
Pickens	<0.1	0.44	0.39
Richland	1.40	3.58	3.66
Saluda	<0.1	0.41	0.36
Spartanburg	0.10	1.15	1.35
Sumter	0.30	1.18	1.16
Union	0.10	0.12	0.11
Williamsburg	0.40	0.81	0.68
York	0.10	1.03	1.10
AL		0.01	0.01
FL		0.00	0.01
GA		0.06	0.07
NC		0.01	0.01
TN		0.00	
VA			0.01
WI		0.01	0.01
Total Out of State	N/A	0.09	0.12
Total	100	100	100

license holders (Table 3) was obtained by multiplying the number of licenses issued in each residence category by the percentage of positive responses received per region. Assistants were the numbers of different individuals who accompanied active license holders. Although some individuals were probably counted by more than one license holder, the extent of such duplication was assumed to be negligible. The average number of assistants (1.97 overall) per license holder in each residence category was multiplied by the estimated number of license holders to obtain the estimated total numbers of assistants (14,101). The total number of participants (21,258) is the sum of the active license holders and their assistants.

Effort

The overall average seasonal effort was 4.17 trips per active licensee. The average numbers of season trips per active license holder were obtained by summing the number of trips reported in each residence category and dividing these figures by the numbers of respondents who reported trips. These means were then multiplied by the estimated numbers of active license holders in the overall populations to obtain estimates of seasonal effort by residence category (Table 4). The estimated numbers of trips per month were calculated by multiplying these season totals by the appropriate percentages of trips in each month. These were determined from the data provided by respondents who broke their seasonal effort down into complete monthly components (N = 798, 91.6% of active licensees). The estimated effort numbers in the Total column (Table 4) were generated by adding these categorical figures. The distribution of seasonal effort by residential region is shown in Table 5.

The coastal area was divided into six geographical areas as described below (Figure 2):

- Beaufort – From the Savannah River to the south end of St. Helena Island, including the Beaufort River
- St. Helena Sound – From the south end of St. Helena Island to the South Edisto River and southern end of Edisto Island
- Wadmalaw/Edisto Islands – From the South Edisto River to the Stono River, including Edisto, Wadmalaw, Seabrook, Kiawah, and Johns Island

Table 2. Distribution of 2006 shrimp baiting licensees by residential category.

Region	Total Population (N)	%	Sample Population (N)	%	Respondent Population (N)	%
North Coastal						
Georgetown	499		207	5.18	62	5.05
Horry	381		141	3.53	35	2.85
Total	880	8.72	348	8.70	97	7.90
Central Coastal						
Berkeley	708		275	6.88	86	7.00
Charleston	2307		903	22.58	251	20.44
Dorchester	462		198	4.95	56	4.56
Total	3477	34.46	1376	34.40	393	32.00
South Coastal						
Beaufort	1176		468	11.70	141	11.48
Colleton	345		125	3.13	29	2.36
Hampton	242		104	2.60	29	2.36
Jasper	159		63	1.58	17	1.38
Total	1922	19.05	760	19.00	216	17.59
Central Inland						
Aiken	394		158	3.95	49	3.99
Allendale	60		21	0.53	9	0.73
Bamberg	96		33	0.83	7	0.57
Barnwell	150		66	1.65	16	1.30
Lexington	561		225	5.63	70	5.70
Orangeburg	295		122	3.05	41	3.34
Richland	369		137	3.43	59	4.80
Total	1925	19.08	762	19.05	251	20.44
Other Counties	1875	18.58	742	18.55	268	21.82
Out of State	12	0.12	12	0.30	3	0.24
Total	**10091**		**4000**		**1228**	

Table 3. Estimated participation by residential category.

	North Coast	Central Coast	South Coast	Central Inland	Other Counties	Out of State	Total
Licenses issued	880	3477	1922	1925	1875	12	10091
Percent active licenses	63.9	74.3	64.8	74.9	69.8	66.7	70.9
Number of active licenses	562	2583	1246	1442	1308	8	7157
Average number of assistants	2.11	1.92	1.90	1.97	2.05	2.00	1.97
Total number of assistants	1188	4955	2367	2845	2687	16	14101
Total number of participants	1751	7538	3613	4287	3995	24	21258
Percent of Total	8.24	35.46	16.99	20.17	18.79	0.11	100

- Charleston – From the Stono River to the north end of Isle of Palms
- Bulls Bay – From the north end of the Isle of Palms to the southern boundary of Georgetown County, near the Santee River
- Georgetown – Georgetown and Horry Counties, including Winyah Bay

The distribution of estimated effort in each area is indicated in Table 6. These figures were obtained by multiplying the total numbers of trips in each residence category by the percentages of effort reported in each area. These percentages were determined by summing all trips reported by area within each residence category, then dividing the numbers associated with each area by these sums.

Table 4. Estimated number of trips by residential category.

	North Coast	Central Coast	South Coast	Central Inland	Other Counties	Out of State	Total
Average Trips/Active License Holder	4.76	4.19	4.05	4.18	3.54	8.00	4.17
Percentage By Month							
September	33.3	32.7	35.9	37.6	38.2	25.0	35.4
October	53.4	46.8	50.1	45.8	46.2	68.8	47.6
November	13.2	20.5	14.0	16.6	15.6	6.3	17.0
Estimated Trips per Month							
September	892	3542	1810	2264	1767	16	10290
October	1429	5069	2526	2760	2139	44	13967
November	354	2222	706	1001	723	4	5011
Total	2676	10833	5042	6024	4629	64	29268
Percentage of Total	9.14	37.01	17.23	20.58	15.82	0.22	100

Table 5. Distribution of seasonal effort in percentage of respondents by residential category.

Residential Region	Trips/license holder/season				
	1 - 4	5 - 10	11 - 15	16 - 20	> 20
North Coast	65	27	6	2	0
Central Coast	66	28	3	1	1
South Coast	64	29	5	2	0
Central Inland	69	24	6	0	1
Other SC Counties	74	21	3	1	1
Out of State	0	100	0	0	0
Statewide	68	26	4	1	1

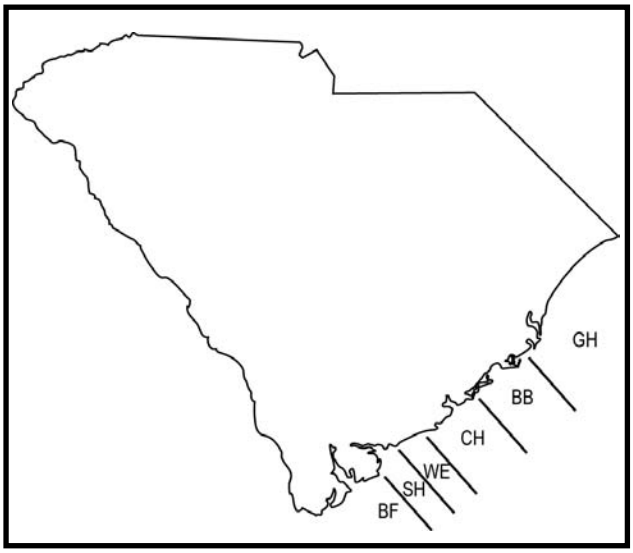

Figure 2. Shrimp baiting areas.

Table 6. Estimated number of trips by shrimping area.

Residence Category	Beaufort	St. Helena	Wadmalaw/Edisto	Charleston	Bulls Bay	Georgetown	Total
North Coast	0	28	0	103	2107	438	2676
Central Coast	283	333	975	5683	3433	125	10833
South Coast	4304	555	104	52	26	0	5042
Central Inland	2812	1676	407	423	697	8	6024
Other Counties	1403	846	323	193	1706	158	4629
Out of State	0	40	24	0	0	0	64
Total	8803	3479	1834	6453	7969	729	29268
Percentage of Total	30.08	11.89	6.27	22.05	27.23	2.49	100.00

Catch Rates

Average seasonal catch rates are listed in Table 7. These were obtained by adding the reported catch per unit of effort (CPUE, in quarts of whole shrimp per trip) in each residential category and dividing by the numbers of observations. Comparisons were made between reported CPUE and calculated CPUE (dividing the total reported catch by the total number of trips for each active respondent). No significant differences were seen between the reported and calculated CPUEs. Reported CPUE's were used for all subsequent calculations. The CPUEs by shrimping area (Table 8) were calculated by summing the seasonal CPUEs for each area and dividing these figures by the corresponding numbers of observations. Only the data from respondents who limited their activity to one area were included (N = 732, 84% of active licensees), since there was no way to separate catch and effort by area for respondents who shrimped in more than one area.

Table 7. CPUE (quarts of whole shrimp per trip) by residential category.

Region	CPUE
North Coast	20.61
Central Coast	19.11
South Coast	19.65
Central Inland	22.35
Other SC Counties	21.97
Out of State	19.00
Total	20.62

**Done with reported CPUE

Table 8. CPUE (quarts of whole shrimp/trip) by shrimping area.

Shrimping Location	Estimate CPUE
Beaufort	22.69
St Helena	19.45
Wadmalaw/Edisto	16.36
Charleston	18.91
Bulls Bay	23.17
Georgetown	16.06

**Done with reported CPUE

Because the residential stratification of the sample population was similar to that of the total license holder population, an unbiased estimate of the average statewide CPUE can be obtained by calculating the mean of the CPUEs reported by the respondents. This value was **20.62 quarts of whole shrimp per trip**.

Catch

The average seasonal catches (quarts of whole shrimp) reported by respondents were as follows for residential regions:

Residential Region	Average Seasonal Catch
North Coast	95.42 quarts of whole shrimp
Central Coast	85.68 quarts of whole shrimp
South Coast	82.67 quarts of whole shrimp
Central Inland	91.64 quarts of whole shrimp
Other SC Counties	81.43 quarts of whole shrimp
Out of State	152.00 quarts of whole shrimp
Overall	86.76 quarts of whole shrimp

There are numerous ways to estimate the total catch, depending on the interest in its relative components. The simplest method is to multiply the statewide average CPUE by the estimated number of total trips:

Catch Estimate 1

20.62 statewide quarts per trip x 29,268 total trips = **603,438 quarts whole shrimp**

Similarly, the total number of active license holders can be multiplied by the statewide average seasonal catch per respondent:

Catch Estimate 2

93.77 statewide seasonal catch x 7,157 estimated active licensees = **671,158 quarts whole shrimp**

An estimate can be derived from the average catch data above by multiplying them by the appropriate numbers of active shrimpers. This method produced the following estimates:

Catch Estimate 3

Residential Region	Average Seasonal Catch	Average Active Licensees	Catch Estimate
North Coast	95.42	562.47	53,670.05
Central Coast	85.68	2,583.42	221,350.73
South Coast	82.67	1,245.74	102,985.83
Central Inland	91.64	1,441.83	132,131.46
Other SC Counties	81.43	1,308.30	106,535.48
Out of State	152.00	8.00	1,216.00
			617,890 quarts whole shrimp

Catches by residence category were also estimated by multiplying the estimated effort for each by the appropriate CPUE. This approach generated the following results:

Catch Estimate 4

Residential Region	Total Estimated Trips	Average CPUE	Catch Estimate
North Coast	2,675.65	20.61	55,153.01
Central Coast	10,833.17	19.11	207,054.56
South Coast	5,041.99	19.65	99,075.09
Central Inland	6,024.31	22.35	134,617.72
Other SC Counties	4,628.87	21.97	101,711.41
Out of State	64.00	19.00	1,216.00
			598,828 quarts whole shrimp

Catches by shrimping area were obtained by multiplying the estimated effort in each by the corresponding average estimated CPUE.

Catch Estimate 5

Shrimping Area	Total Estimated Trips	Average Estimated CPUE	Catch Estimate
Beaufort	8,803.17	22.69	199,744.73
St. Helena Sound	3,479.15	19.44	67,660.37
Wadmalaw/Edisto	1,833.75	16.35	29,999.05
Charleston	6,453.49	18.91	122,033.32
Bulls Bay	7,969.24	23.17	184,680.33
Georgetown	729.20	16.06	11,710.07
			615,828 quarts whole shrimp

There are trade-offs in probable accuracy and lack of bias associated with each approach and an intermediate value is a reasonable overall estimate. The average of the five estimates shown above is **621,428 quarts whole shrimp**. The conversion factor from quarts to pounds (whole weight) is 1.48. The weight equivalent of whole shrimp is **919,714 pounds**. To convert whole weight to heads off weight, whole weight is divided by 1.54, giving an estimate of **597,217 pounds heads-off**.

The distribution of season catches by residence category is shown in Table 9. A conservative estimate of the statewide average catch per active license

holder, based on the respondents' estimates of their season catches, was 86.8 quarts whole shrimp (128.5 pounds whole shrimp). Assuming equal shares for license holders and their assistants, the average yield per participant was about 29.2 quarts whole shrimp (43.3 pounds whole shrimp).

Table 9. Distribution of season catches (quarts of whole shrimp) in percentages of respondents by residential category.

	Catch (qt. whole shrimp) /license holder/season					
Residential Region	<99	100-199	200-299	300-399	400-499	>500
North Coast	68	18	8	3	2	2
Central Coast	70	15	11	3	1	1
South Coast	72	18	4	4	1	1
Central Inland	64	23	7	4	2	1
Other SC Counties	72	16	7	4	1	1
Out of State	50	0	0	50	0	0
Statewide	69	17	8	3	1	1

The competition between commercial and recreational interests of the fall white shrimp harvest is perceived as an allocation issue. Since 1992, a monitoring system for commercial landings has been in place that licenses comparison of recreational and commercial landings for comparable area/time units. The baiting areas and corresponding commercial statistical zones are as follows:

Baiting Area	Commercial Zone
Beaufort (rivers and sound)	Hilton Head to Bay Point
St. Helena Sound	Bay Point to South Edisto River
Wadmalaw/Edisto Islands	South Edisto River to Stono Inlet
Charleston (rivers and harbor)	Stono Inlet to Dewees Inlet
Bulls Bay	Dewees Inlet to Cape Romain
Georgetown (rivers and bay)	Cape Romain to NC Line including Winyah and Santee Bays

The comparison of baiting and commercial landings is shown in Table 10. In-season commercial landings were defined as those from September 15, 2006 through November 13, 2006. Total commercial landings included those from August 1, 2006 through the closure of the 2006 season (January 15, 2007). Combined total recreational and commercial landings are the baiting catch plus the total commercial landings as so defined. All 2006 commercial landings data are preliminary and may be subject to slight changes with time.

Table 10. Estimated shrimp baiting catches and reported commercial landings (wild-caught, all gears) by area, in thousands of pounds whole shrimp.

	Commercial		Percent baiting	
Shrimping Area	**In-season**	**Total**	**In-season**	**Total**
Beaufort	141,270	227,578	68	57
St. Helena	273,159	457,359	27	18
Wadmalaw/Edisto	137,458	206,677	24	18
Charleston	137,006	230,053	57	44
Bulls Bay	101,327	164,766	73	62
Georgetown	351,248	709,510	5	2
Total	1,141,468	1,995,943	44	31

Comparisons between areas are influenced by factors, such as the relative sizes of recreational population and trawler fleet, proximity of population centers and trawler docks, accessibility of inland waters, and extent of inland waters versus trawlable coastal waters.

Experience in Fishery

The majority of survey respondents have participated in the shrimp baiting fishery between six and ten years with the most experienced licensees residing on the central coast followed by counties on the central inland and southern coast (Table 11). Respondents new to the fishery resided primarily on the central coast and in other non-coastal counties (excluding the central inland counties).

Experience seemed to influence shrimping success (at least for a number of years) with the highest catch rates seen in those participants who have been in the fishery the longest (Table 12). However, as one

Table 11. Shrimp baiting experience of survey respondents by residential category. Percent of grand total in parentheses.

Years of Experience	North Coast	Central Coast	South Coast	Central Inland	Other SC Counties	Out of State
1-2	13 (1.06)	77 (6.27)	43 (3.50)	28 (2.28)	48 (3.91)	1 (0.08)
3-5	21 (1.71)	79 (6.43)	36 (2.93)	51 (4.15)	74 (6.03)	2 (0.16)
6-10	29 (2.36)	103 (8.39)	66 (5.37)	70 (5.70)	79 (6.43)	0 (0.00)
11-15	18 (1.47)	55 (4.48)	35 (2.85)	55 (4.48)	36 (2.93)	0 (0.00)
>15	12 (0.98)	73 (5.94)	33 (2.69)	43 (3.50)	27 (2.20)	0 (0.00)
Total by Region	97 (7.90)	393 (32.00)	216 (17.59)	251 (20.44)	268 (21.82)	3 (0.24)

Table 12. Shrimp baiting experience and corresponding average CPUE for overall respondent population.

Years of Experience	Number of Licensees	Percent of Licensees	Average CPUE
1-2	210	17.40	11.3
3-5	263	21.79	14.8
6-10	347	28.75	15.1
11-15	199	16.49	17.8
>15	188	15.58	14.6

would expect, participation only seemed to influence success up to a certain point in the fishery (i.e. law of diminishing returns), as is seen in the data.

DISCUSSION

Documentation of seasonal statistics began in 1987 (Theiling). Table 13 summarizes the data for each year's fishery.

The number of shrimp baiting license holders has been in decline since 1998. However, license sales in 2006 increased and were approximately 12% higher (1,087 licenses) than last year. Nevertheless, sales were still one of the five lowest recorded since the license was put into place in 1988. Sales were 42% percent below the peak level obtained in 1998 and 27% below the 10 year average (1995-2005). Preseason forecasts of shrimp abundance were good. However, the low price of commercially available shrimp may have encouraged the purchase of commercial shrimp, and the high price of gasoline may have discouraged shrimp baiting participation. These two factors probably contributed to reduced license sales as well as relatively low participation by licensed shrimp baiters.

Overall the 2006 baiting season was marked with fair weather without a substantial amount of rainfall. Although weather was favorable for most of the season, the percentage of active license holders was the lowest on record at 71%, 11.5 % below the 10 year average (1995-2005; Figure 3). The average number of assistants per active license holder (1.97) was 5% lower than last year and just slightly below the 10 year average of 2.0. A slight rise was seen in the number of participants, due primarily to the increase in licenses. However, participation was still substantially lower than it has been over the past fifteen years.

Average individual effort was the lowest reported since the license was established in 1988 at 4.17 trips per active licensee. Statewide effort (29,268 trips) was the lowest recorded to date, eclipsing last year's previous low of 31,238 trips (Figure 4). Effort decreased along most of the coastal areas with the largest declines reported in the St. Helena and Charleston areas. The Georgetown and Bulls Bay areas were the only ones that saw an increase in fishing effort. The increase reported in Georgetown was small (5% or 38 trips), accounting for only 2.5% of the total statewide effort. However, the estimated effort in Bulls Bay increased by over 15% (over 1,000 trips) accounting for over 27% of the total statewide effort.

The statewide CPUE (20.62 qts. whole shrimp / trip) decreased 11.6% from last year's rate and was just slightly above the 10 year average (1995-2005) of 20.16 quarts whole shrimp per trip. Catch rates decreased in all coastal areas when compared to the 2005 season. The smallest declines were seen in the Wadmalaw / Edisto Islands and Bulls Bay areas, followed closely by the Beaufort area. Catch rates were highest in the Bulls Bay and Beaufort areas. Distribution of effort appeared to be influenced by shrimp-

Table 13. Seasonal comparisons of shrimp baiting participation, effort, and catch parameters.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Licenses issued	NA	5,509	6,644	9,703	12,005	11,571	12,984	13,366	13,919	14,156
Percent active licenses	NA	92	82	94	89	87	91	86	89	85
Assistants/license holder	NA	2.5	2.14	2.79	2.24	2.15	2.43	2.32	2.39	2.25
Participants	21,735	17,749	17,171	34,662	34,821	31,812	40,620	38,081	41,971	38,932
Trips/license holder	NA	7	5.7	7.8	6.6	6.1	6.8	6	6.5	6.6
Total Trips	40,101	35,609	31,624	71,153	71,034	62,459	80,709	70,429	81,632	68,927
Average quarts/trip	28.5	22.1	26.5	25.6	21.3	25.4	23.5	18.5	28.9	16.9
Whole pounds (millions)	1.8	1.16	1.25	2.75	2.14	2.35	2.72	1.91	3.4	1.73
Pounds/participant	83	65	73	79	62	74	67	50	81	44
Share of Total Harvest	29	32	24	46	29	39	44	34	33	35
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Licenses issued	15,488	17,497	15,895	15,929	13,698	13,903	12,445	10,609	9,004	10,091
Percent active licenses	91	87	81	81	87	78	81	73	75	71
Assistants/license holder	2.44	2.31	2.09	1.93	2.18	1.96	1.76	1.5	2.07	1.97
Participants	48,544	50,436	39,514	37,622	37,699	32,038	28,028	19,668	20,753	21,258
Trips/license holder	6.6	6	5.1	4.8	5.8	5	5.8	5.2	4.9	4.17
Total Trips	94,154	92,484	66,396	61,445	69,847	54,610	58,533	39,893	31,238	29,268
Average quarts/trip	26.4	21.7	21.1	10.2	20.3	14.2	21.8	17	23.33	20.62
Whole pounds (millions)	3.63	2.91	2.02	0.91	2.09	1.11	1.87	0.991	1.09	0.912
Pounds/participant	72	58	46	23	53	35	67	50	52	43.3
Share of Total Harvest	43	41	31	24	47	31	47	27	23	30

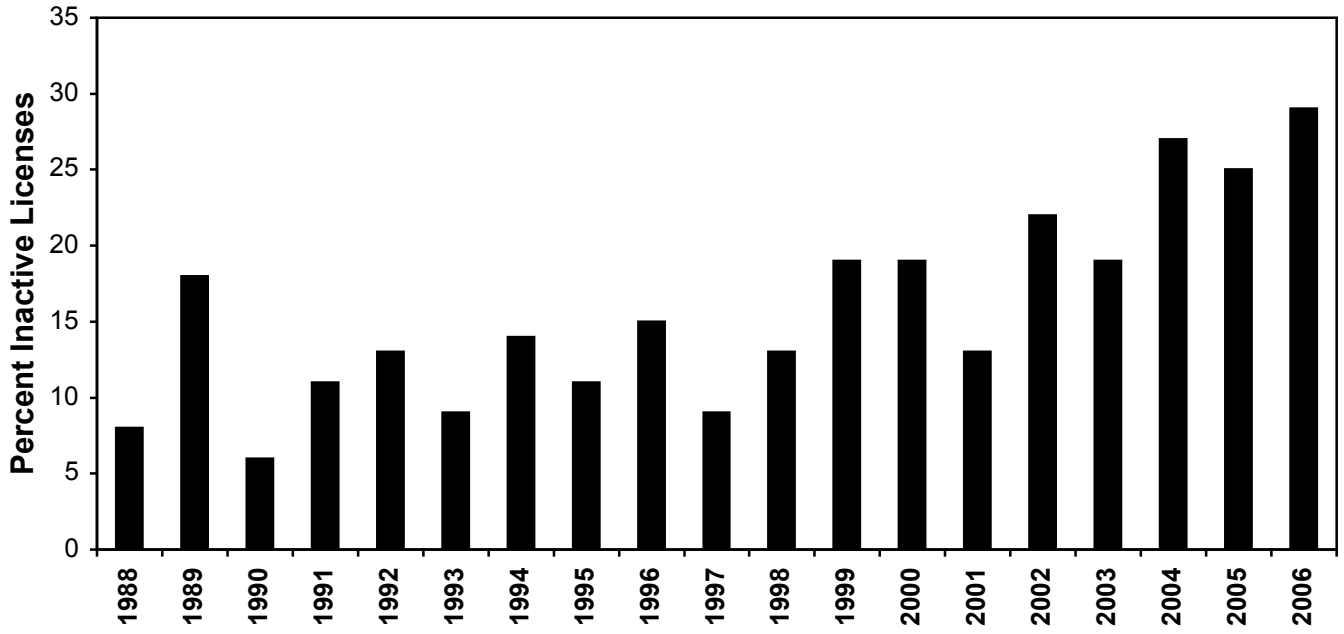

Figure 3. Percent of inactive shrimp baiting licenses, 1988-2006. Inactive licenses were defined as those current license holders that made no trips using their gear and tags.

ing success with the Bulls Bay and Beaufort areas accounting for over 57.1% of the 2006 effort. The highest catch rates were seen in the Bulls Bay area and this may have influenced the substantial increase in effort seen in this area during the 2006 season. Similarly, the Beaufort area experienced the smallest decrease in effort when compared to other regions, which may also be partially explained by the higher catch rates seen in this area. An exception to this pattern was seen in the Georgetown area which had the

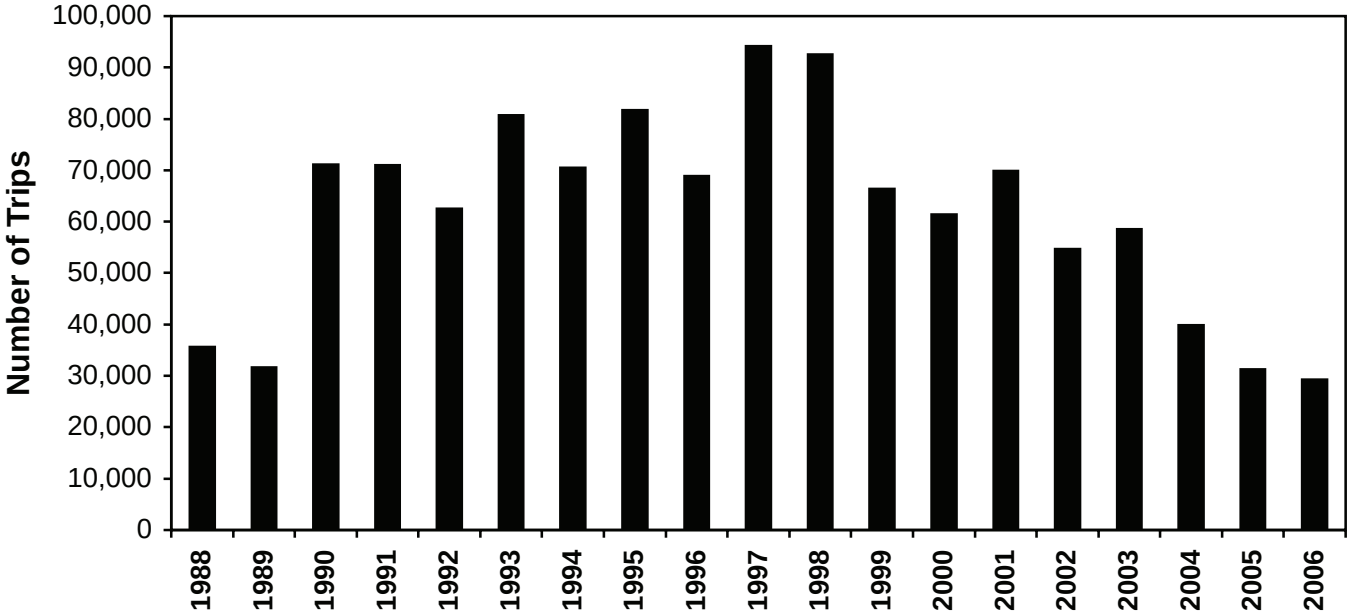

Figure 4. Estimated shrimp baiting effort per season, 1988-2006.

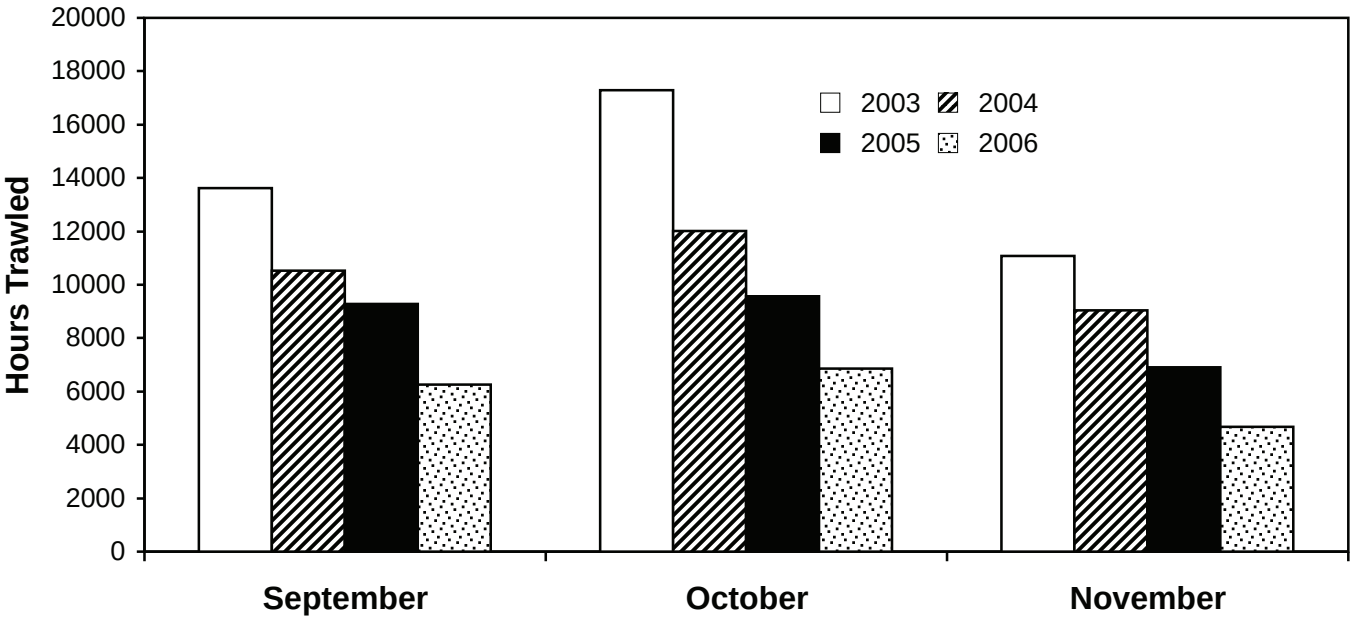

Figure 5. Commercial trawler fall effort, 2003-2006.

lowest catch rate along the coast, yet saw an increase in effort, albeit still accounting for only 2.5% percent of the total effort even with this increase.

In 2006 the total fall harvest (recreational and commercial) was about 1.9 million pounds heads off (~3 million pounds heads on), which is the lowest harvest in the last decade despite a fairly mild winter in 2005-2006. (Severe winters usually result in poor spawning stock and may result in below average shrimp abundance during the following fall.) Baiters comprised 31% of the total harvest and 44% of the in-season harvest. This is higher than the contribution by baiters to the total fall harvest in 2005 and is slightly under the 10 year average (1995-2005) of 35%. The Bulls Bay and Beaufort areas contributed most to this harvest with baiting accounting for 62% of the total

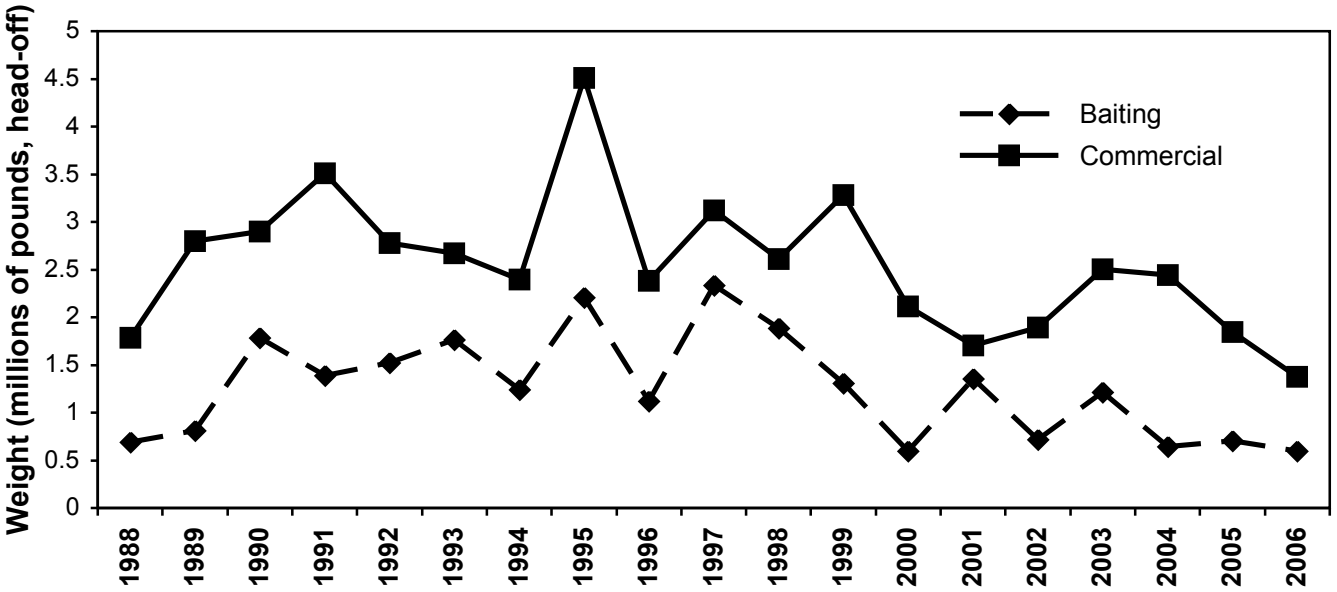

Figure 6. Comparison of estimated shrimp baiting catches and reported commercial landings (all years, wild-caught) from 1988-2006.

harvest in Bulls Bay and 57% of the total harvest in Beaufort. The baiters share was below the ten-year average in the Beaufort, Wadmalaw/Edisto Islands, Charleston, and Georgetown areas, but above it in the Bulls Bay area. In St. Helena, the baiters' share was near the ten-year average.

Approximately 1.4 million pounds heads off of the fall harvest was attributed to commercial trawlers, which is well below the ten-year average of 2.5 million pounds heads off. This may potentially be credited to the substantial decrease in effort by commercial shrimpers over the past few years (Figure 5). Although no distinct pattern can currently be detected, the gap between the fall commercial and baiter harvest may narrow if effort continues to decline in the commercial fishery (Figure 6). If this occurs, one could speculate baiters may more adequately reflect the state of the resource because historically their effort has remained more constant, although in recent years effort among baiters has also decreased.

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APPENDIX 1

University of South Carolina's School of Public Health survey questionnaire and results.

To get more information about the survey findings, see

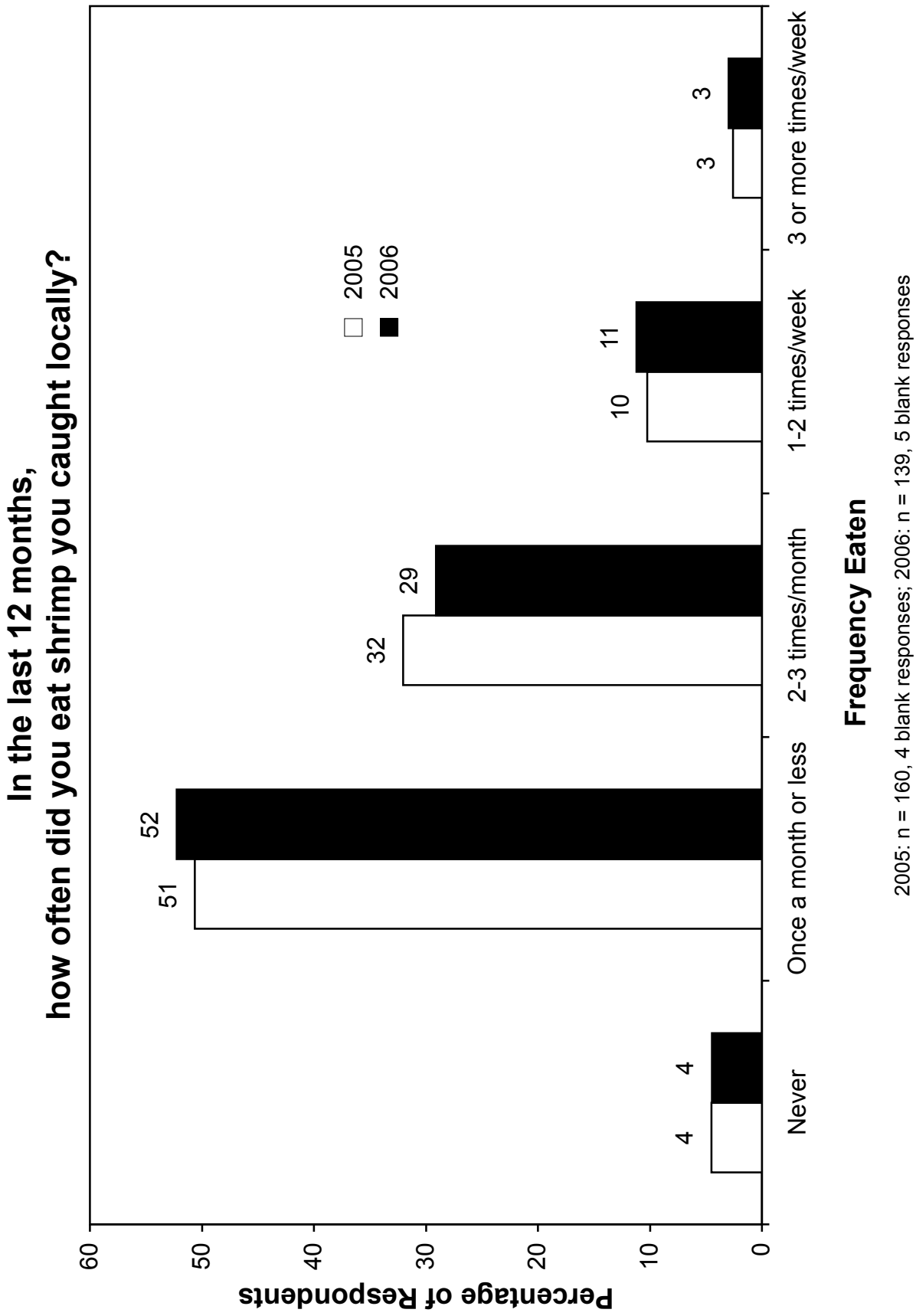
Laska, D. and J. Vena. 2007. Seafood consumption habits of South Carolina shrimp baiters: a pilot study – comparison of two years. University of South Carolina, School of Public Health, Department of Epidemiology and Biostatistics: Columbia, SC. Unpublished.

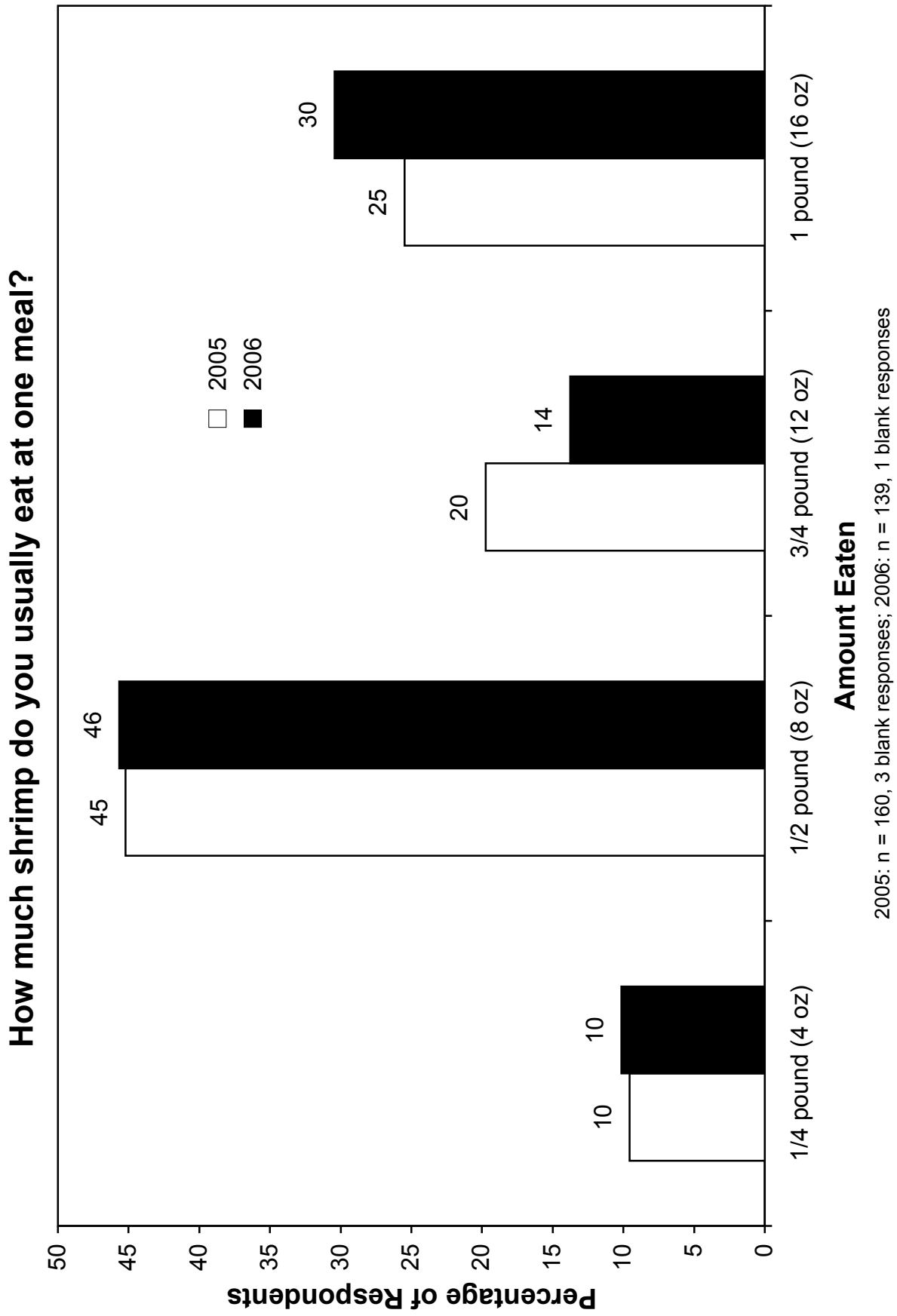
UNIVERSITY OF SOUTH CAROLINA

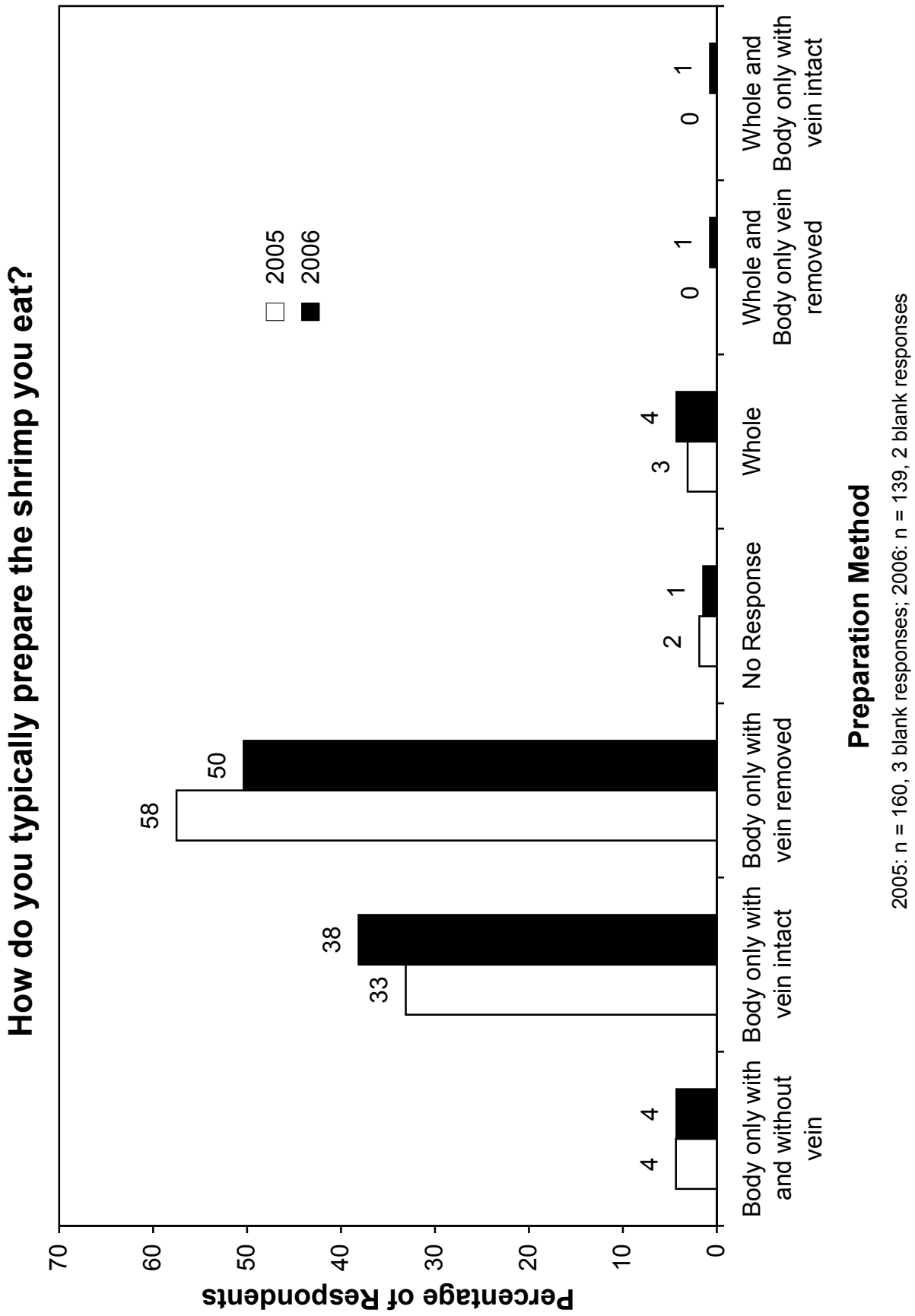
This survey is being conducted by the **University of South Carolina's School of Public Health**. We want to find out more on human health and seafood. **Your answers to the following questions are very important to us**. Participation in this survey is voluntary. For further information contact: 843-762-8645. *Please circle your answer.*

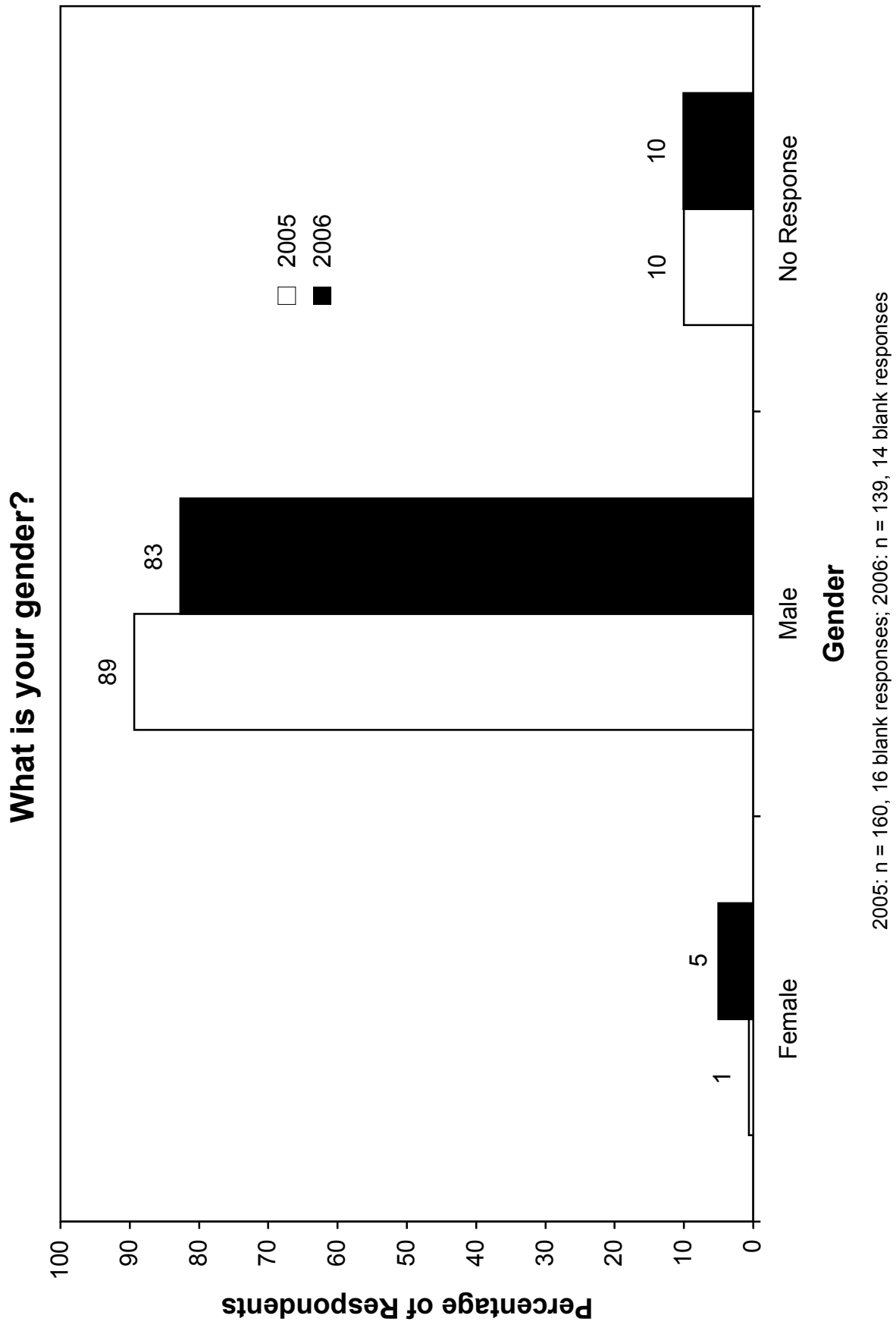
1. In the last 12 months, how often did you eat shrimp you **caught locally**? (Please include shrimp caught by yourself, family, and friends)
   Never 1-6/year 7-11/year 1/month 2-3/month 1/week 2/week 3-4/week 5+/week
2. How much shrimp do you **usually** eat at one meal?
   ¼ pound (4 oz) ½ pound (8 oz) ¾ pound (12 oz) 1 pound (16 oz)
3. How do you **typically** prepare the shrimp you eat?
   Whole Body only with vein intact Body only with vein removed
4. In the last 12 months, what was the **most common** location and body of water you caught your shrimp? _____
5. In the last 12 months, what other **locally caught** seafood did you eat? *CIRCLE ALL*
   Blue Crab Dolphin (Mahi Mahi) Hard Clam (quahog) King Mackerel Oysters Red Drum
   Scamp Grouper Shark (What _____) Sheepshead Snapper Tuna Wreckfish
   Southern Flounder Spanish Mackerel Spotted Sea Trout Stripped Mullet Summer Flounder
   Swordfish Triggerfish Other:_____
6. What is your gender (Male or Female) and your age (18-25 26-30 31-35 36-40 41-45 46-50 51-55 55+)?

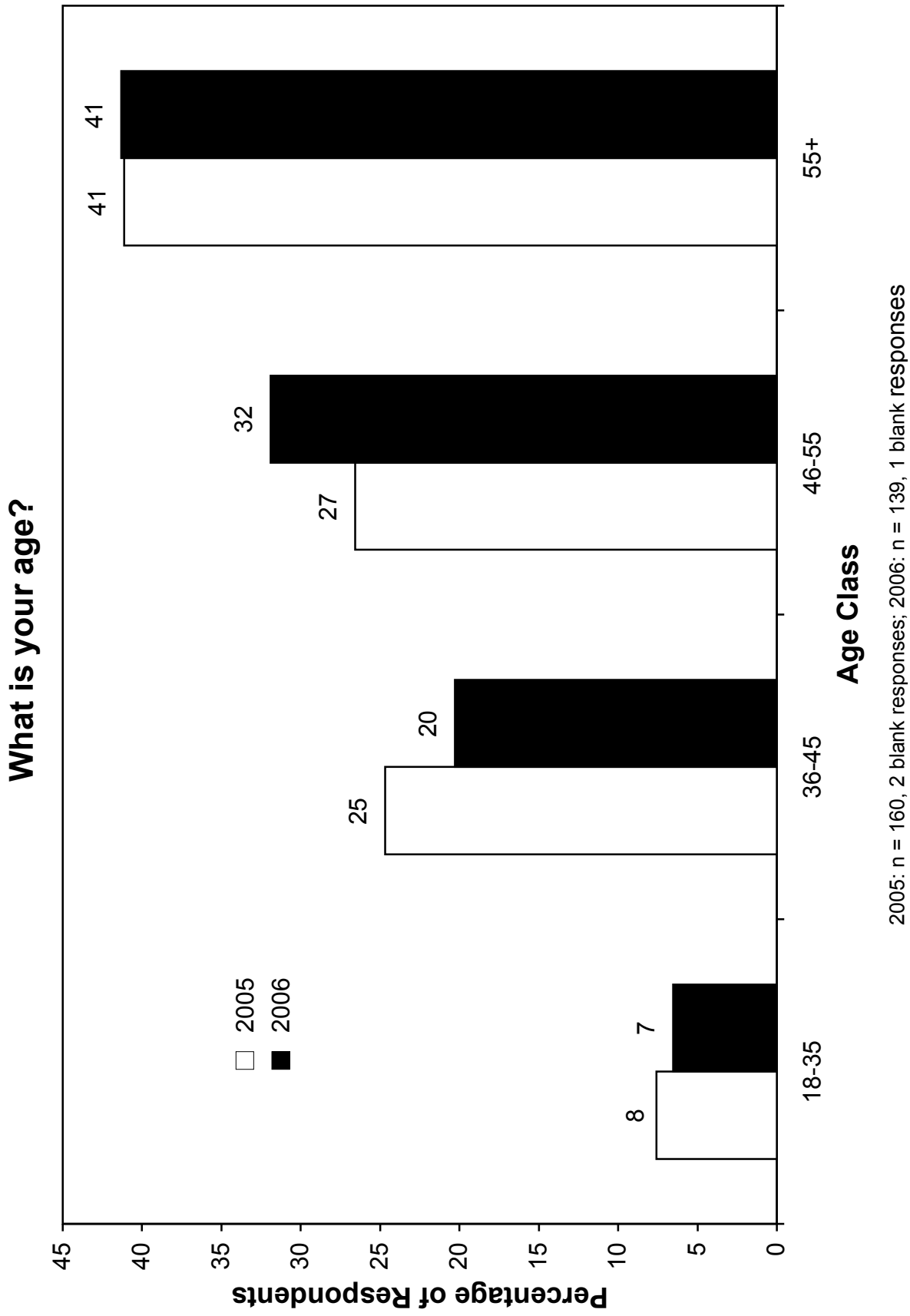
30322/11/05

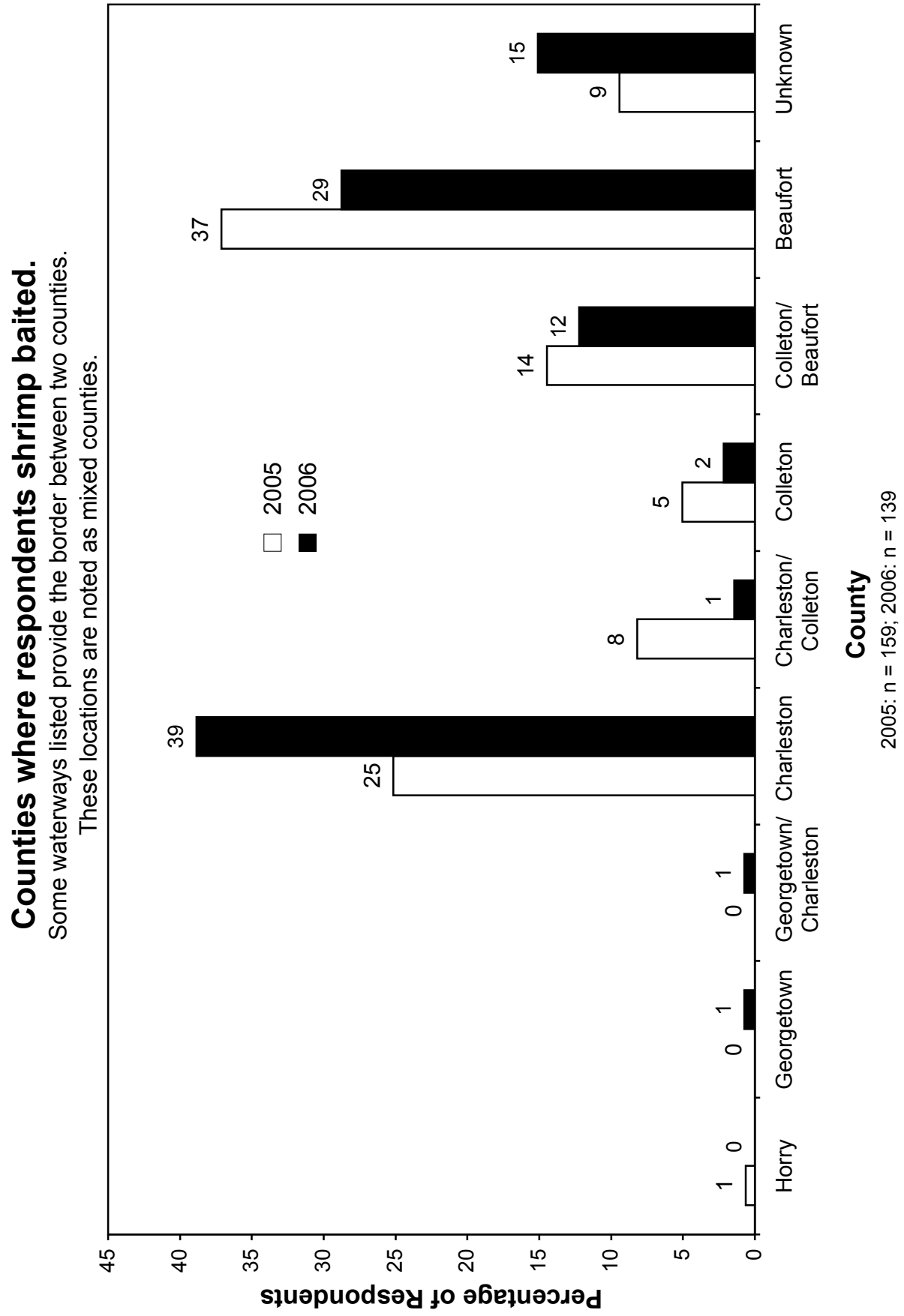

In the last 12 months,
how often did you eat shrimp you caught locally?
Percentage of Respondents
0
10
20
30
40
50
60
2005
2006
4
4
51
52
32
29
10
11
3
3
Never
Once a month or less
2-3 times/month
1-2 times/week
3 or more times/week
Frequency Eaten
2005: n = 160, 4 blank responses; 2006: n = 139, 5 blank responses

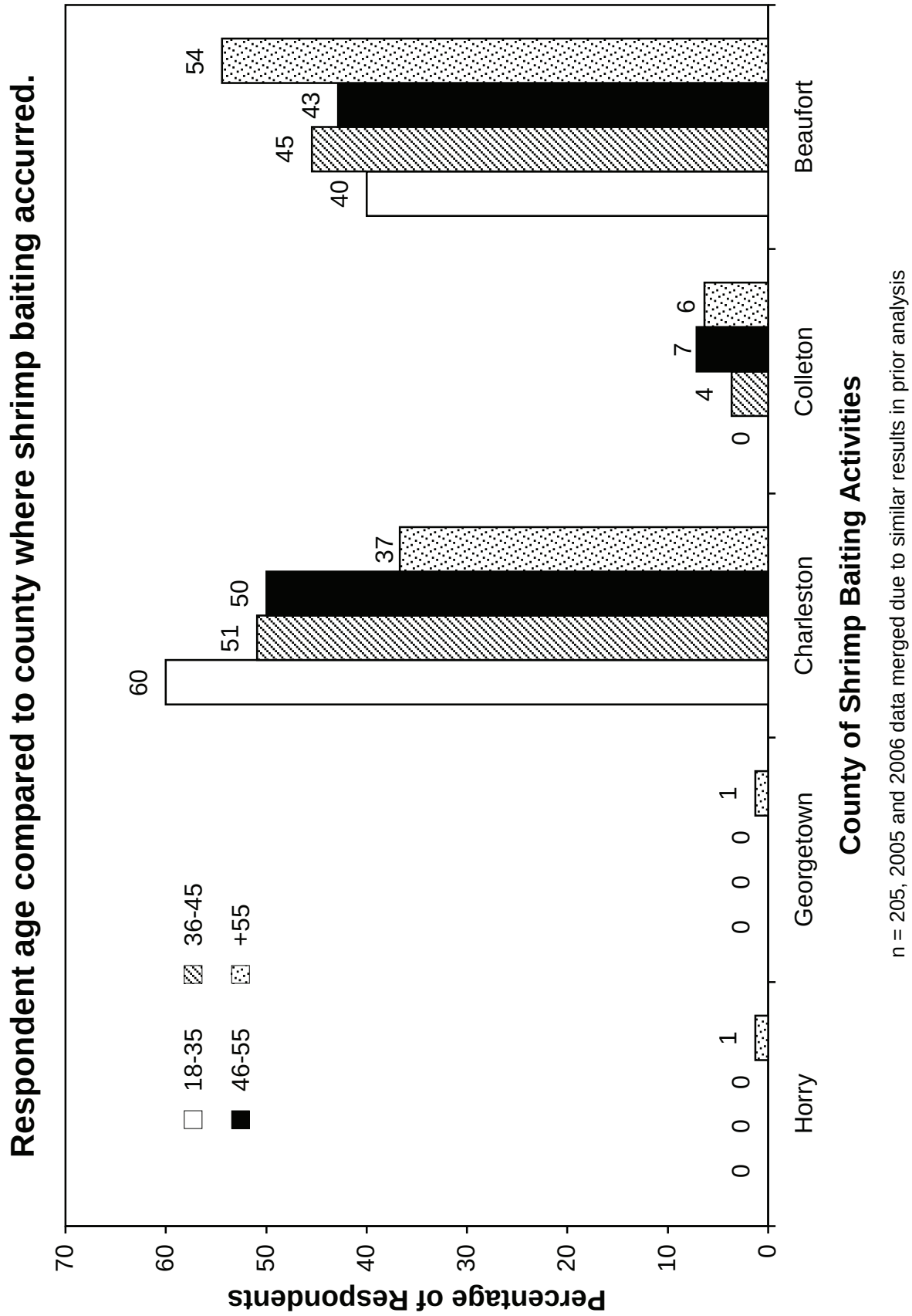

How much shrimp do you usually eat at one meal?
Percentage of Respondents
0
5
10
15
20
25
30
35
40
45
50
2005
2006
10
10
45
46
20
14
25
30
1/4 pound (4 oz)
1/2 pound (8 oz)
3/4 pound (12 oz)
1 pound (16 oz)
Amount Eaten
2005: n = 160, 3 blank responses; 2006: n = 139, 1 blank responses

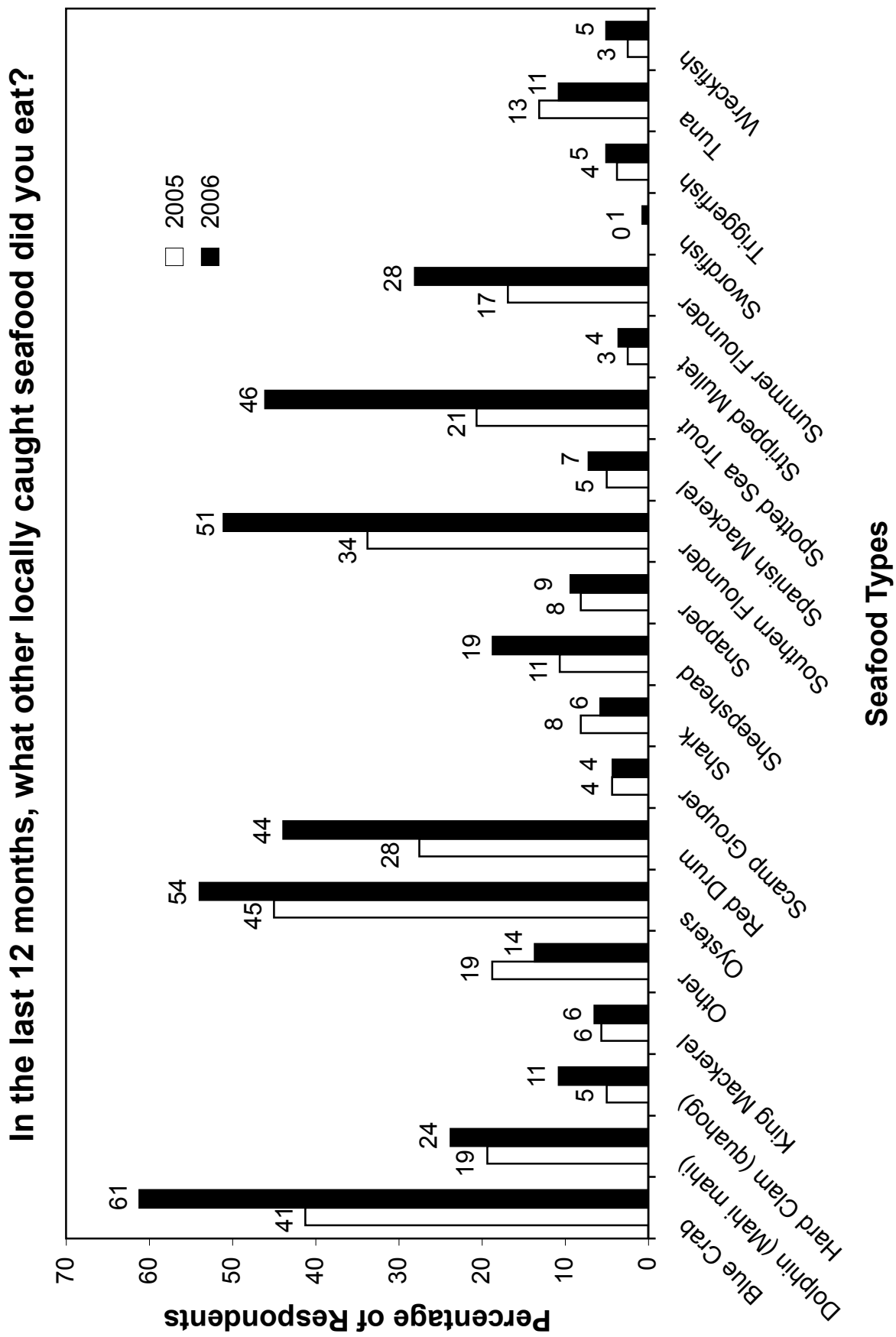

How do you typically prepare the shrimp you eat?
Percentage of Respondents
0
10
20
30
40
50
60
70
2005
2006
4
4
Body only with and without vein
33
38
Body only with vein intact
58
50
Body only with vein removed
2
1
No Response
3
4
Whole
0
1
Whole and Body only vein removed
0
1
Whole and Body only with vein intact
Preparation Method
2005: n = 160, 3 blank responses; 2006: n = 139, 2 blank responses


What is your gender?
Percentage of Respondents
100
90
80
70
60
50
40
30
20
10
0
2005
2006
89
83
1
5
10
10
Female
Male
No Response
Gender
2005: n = 160, 16 blank responses; 2006: n = 139, 14 blank responses


What is your age?
Percentage of Respondents
0
5
10
15
20
25
30
35
40
45
2005
2006
8
7
25
20
27
32
41
41
18-35
36-45
46-55
55+
Age Class
2005: n = 160, 2 blank responses; 2006: n = 139, 1 blank responses


Counties where respondents shrimp baited.
Some waterways listed provide the border between two counties.
These locations are noted as mixed counties.
Percentage of Respondents
0
5
10
15
20
25
30
35
40
45
2005
2006
1
0
0
1
0
1
39
25
8
1
5
2
14
12
37
29
9
15
Horry
Georgetown
Georgetown/ Charleston
Charleston
Charleston/ Colleton
Colleton
Colleton/ Beaufort
Beaufort
Unknown
County
2005: n = 159; 2006: n = 139


Respondent age compared to county where shrimp baiting accurred.
Percentage of Respondents
0
10
20
30
40
50
60
70
18-35
36-45
46-55
+55
0 0 0 1
0 0 0 1
60
51 50
37
4 7 6
0
40
45 43
54
Horry
Georgetown
Charleston
Colleton
Beaufort
County of Shrimp Baiting Activities
n = 205, 2005 and 2006 data merged due to similar results in prior analysis


In the last 12 months, what other locally caught seafood did you eat?
Percentage of Respondents
Seafood Types
2005
2006
Blue Crab
Dolphin (Mahi mahi)
Hard Clam (quahog)
King Mackerel
Other
Oysters
Red Drum
Scamp Grouper
Shark
Sheepshead
Snapper
Southern Flounder
Spanish Mackerel
Spotted Sea Trout
Stripped Mullet
Summer Flounder
Swordfish
Triggerfish
Tuna
Wreckfish
0
10
20
30
40
50
60
70
61
41
24
19
11
5
6
6
19
14
54
45
44
28
4
4
8
6
19
11
51
34
9
8
7
5
46
21
4
3
28
17
1
0
5
4
13
11
5
3

Demographics of the study population.

Total Participants (2005 & 2006)	299	
County Shrimp Baited In	**Sum**	**%**
Horry	1	0.3%
Georgetown	1	0.3%
Charleston/Georgetown	1	0.3%
Charleston	94	31.4%
Charleston/Colleton	15	5.0%
Colleton	11	3.7%
Colleton/Beaufort	40	13.4%
Beaufort	99	33.1%
No Response	37	12.4%
Gender	**Sum**	**%**
Female	8	2.7%
Male	258	86.3%
No Response	33	11.0%
Age	**Sum**	**%**
18-35	21	7.0%
36-45	67	22.4%
46-55	86	28.8%
55+	122	40.8%
No Response	3	1.0%

Consumption habits of the study population.

Total Participants (2005 & 2006)	299	
Frequency Eaten	**Sum**	**%**
Never	13	4.3%
Once a month or less	149	49.8%
2-3 times per month	89	29.8%
1-2 times per week	31	10.4%
3 or more times per week	8	2.7%
No Response	9	3.0%
Amount per meal	**Sum**	**%**
1 pound (16 oz)	82	27.4%
1/2 pound (8 oz)	134	44.8%
1/4 pound (4 oz)	29	9.7%
3/4 pound (12 oz)	50	16.7%
No Response	4	1.3%
Preparation	**Sum**	**%**
Body only with and without vein	13	4.3%
Body only with vein intact	106	35.5%
Body only with vein removed	162	54.2%
Whole	11	3.7%
Whole and Body only vein removed	1	0.3%
Whole and Body only with vein intact	1	0.3%
No Response	5	1.7%

Other seafood consumed.

Blue Crab (*Callinectes sapidus*)	151	
Oysters (*Crassostrea virginica*)	147	
Southern Flounder (*Paralichthys lethostigma*)	25	
Red Drum (*Sciaenops ocellatus*)	107	
Spotted Sea Trout (*Cynoscion nebulosus*)	98	
Summer Flounder (*Paralichthys dentatus*)	66	
Dolphin (*Mahi mahi*)	64	
Other (some individuals indicated eating more than one 'other' fish)	49	
Whiting (*Menticirrhus americanus*)		(17)
Black Sea Bass (*Centropristis striata*)		(15)
Spot (*Leiostomus xanthurus*)		(8)
Wahoo (*Acanthocybium solandri*)		(7)
Spadefish (*Chaetodipterus faber*)		(5)
Croaker (*Micropogonias undulatus*)		(4)
Black Drum (*Pogonias cromis*)		(3)
Bream (*Archosargus rhomboidalis*)		(2)
Catfish (*Arius felis*)		(2)
Gag Grouper (*Mycteroperca microlepis*)		(2)
Red Grouper (*Epinephelus morio*)		2)
Blue Fish (*Pomatomus saltatrix*)		(1)
Black Drum (*Pogonias cromis*)		(1)
Grunt (*Haemulon* sp.)		(1)
Largemouth Bass (*Micropterus salmoides*)		(1)
Warsaw Grouper (*Epinephelus nigritus*)		(1)
Offshore		(1)
Sheepshead (*Archosargus probatocephalus*)	43	
Tuna (*Thunnus* sp.)	36	
Snapper (*Lutjanus* sp.)	29	
Hard Clam (quahog) (*Mercenaria mercenaria*)	23	
Shark	20	
Sharpnose (*Rhizoprionodon porosus*)		(5)
Bonnethead (*Sphyrna tiburo*)		(5)
Black Tip (*Carcharhinus limbatus*)		(4)
Sand (*Carcharias taurus*)		(2)
Unknown		(2)
Dogfish (*Carcharias taurus*)		(1)
Bull (*Carcharhinus leucas*)		(1)
King Mackerel (*Scomberomorus cavalla*)	18	
Spanish Mackerel (*Scomberomorus maculatos*)	18	
Scamp Grouper (*Mycteroperca phenax*)	13	
Triggerfish (*Balistes capriscus*)	13	
Wreckfish (*Polyprion americanus*)	11	
Striped Mullet (*Mugil cephalus*)	10	
Swordfish (*Xiphias gladius*)	1	

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